

## Overview

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## CEC Research Team

- Charles Eley, FAIA, PE and Larry Ayers, LC, *Eley Associates*
- James Benya, PE, FIES, IALD, LC, *Benya Lighting Design*
- Nancy Clanton, PE, IALD, LC, *Clanton And Associates*
- Lisa Heschong, Architect, LC, *Hescong Mahone Group*
- Roger L. Wright, Ph.D, *RLW Analytics*
- Mazi Shirakh, PE, Gary Flamm, and Bill Pennington *California Energy Commission*





## Agenda

- Overview – Charles Eley
- Summary – Charles Eley
- PIER Research on Outdoor Lighting – Don Auman
- Lighting Zones – Lisa Heschong
- Unconditioned Buildings – Larry Ayers
- Parking Lots – Nancy Clanton
- Building Grounds – Nancy Clanton
- Building Entrances – Lisa Heschong
- Building Facades – Larry Ayers
- Sales Canopies – James Benya
- Outdoor Sales – James Benya
- Signs and Billboards – Lisa Heschong
- Public Rights-of-Way – Nancy Clanton

**Overview**



## Project Goals

- Conserve energy and reduce peak demand.
- Other benefits of the standard such as reduced light trespass and light pollution are not part of the justification for the standards.



Overview





## Scope of the Project

### Standards are being proposed for:

- Unconditioned buildings.
- Parking lots.
- Building grounds.
- Building entrances and exits.
- Building façades.
- Exterior canopies.
- Outdoor sales.
- Billboards and outdoor signage.
- Public rights of way.

### Standards are not being proposed for:

- Traffic signals.
- Sports lighting.
- Illumination of public monuments.
- Lighting for ATMs.
- Decorative gas lighting.
- Lighting for theatrical purposes, including performance, stage, and film and video production.
- Exit signs.
- Lighting that is specifically designated as required by a health or life safety statute, ordinance, or regulation.
- Emergency lighting powered by an emergency source as defined by the California electrical code.

Overview



### The Legislative Mandate

- *25402.5 (3) (c) The commission shall adopt efficiency standards for outdoor lighting. The standards shall be technologically feasible and cost effective. As used in this subdivision, “outdoor lighting” refers to all electrical lighting that is not subject to standards adopted pursuant to Section 25402, and includes, but is not limited to, street lights, traffic lights, parking lot lighting, and billboard lighting. The commission shall consult with the Department of Transportation (CALTRANS) to ensure that outdoor lighting standards that affect CALTRANS are compatible with the department’s policies and standards for safety and illumination levels on state highways.*





## Environmental Impact

- No negative environmental impact is associated with the proposed outdoor lighting standards.
- In addition to saving energy, some of the newer lighting technologies, which are encouraged by the proposed standards, last longer and may result in less need for disposal and/or recycling.
- The standards should also reduce light pollution and trespass.
- Power plant emissions into the atmosphere will be reduced from reduced electricity consumption.

**Overview**



## Public Process

- Adoption expected July 1, 2003,
- Mandatory in 2005.
- Possible incentives for early adoption between the 2003 adoption date and the 2005 effective date.
- The CEC encourages the public and interested parties to participate in the process.



## Project Milestones

- |            |  |
|------------|--|
| January 29 | The CEC and its contractors had a kickoff meeting to identify possible outdoor lighting measures and to make research assignments.   |
| February 1 | The CEC launched its outdoor lighting website and invited the public to suggest outdoor lighting standards and to participate in the process. The project synopsis was posted to the site.                 |
| March 27   | A public workshop was held in Sacramento to discuss the outdoor lighting standards ideas and to receive comment from all interested parties. The Measure Identification Report was presented at that time. |
| June 18    | A public workshop will be held in Sacramento to discuss the proposed standards contained in this document.   |
| August     | A draft standard will be developed, which will incorporate the recommendations developed in this research report, with consideration of input received at the public workshops.                            |



**Overview**



## Scope

- §100(a) of the standards will be modified to include lighting in unconditioned buildings as well as conditioned buildings.
- In addition, outdoor lighting renovations will be subject to the same guidelines currently listed in the standards for indoor lighting renovations.
- New standards proposed for other outdoor lighting applications.



## Lighting Efficacy

- The standards now requires that lamps rated greater than 100 W have an efficacy of at least 60 lumens per watt.
- Eliminate the exception for outdoor lighting that is not connected to the electric system of a building.
- Expand and modify the minimum efficacy requirement for some lighting applications:
  - 70 mean lumens per watt (MLPW) for internally illuminated signs.
  - 55 MLPW for externally illuminated signs.

**Summary**



### Unconditioned Buildings

- Indoor LPDs do not currently apply to spaces that are conditioned or semi-conditioned.
- The existing standards for warehouses, manufacturing facilities, and other spaces would be extended to unconditioned spaces.
- A new LPD standard is proposed for parking garages.



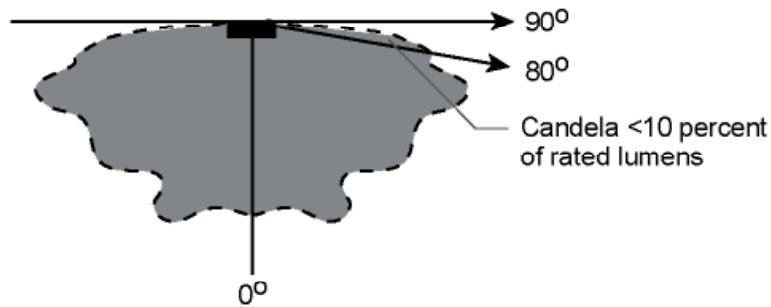
## Controls

- Automatic controls are already required by the standards to turn off exterior lighting during the day and during other periods of time when it is not needed.
- Lighting for parking lots, building entrances, and outdoor sales areas would also need a control that is capable of reducing lighting power to 50% of maximum.

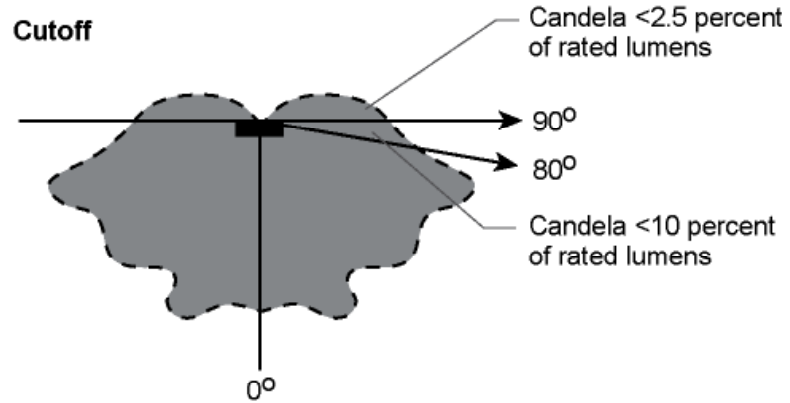


## Shielded Luminaires

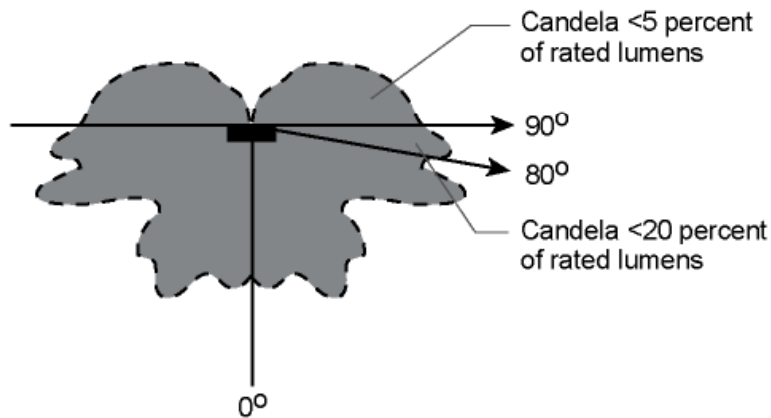
Full Cutoff



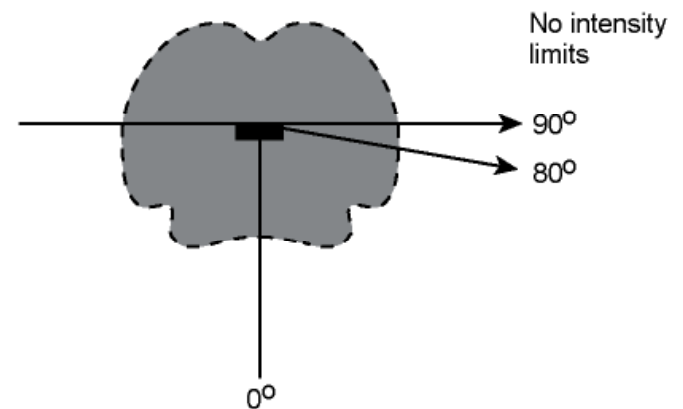
Cutoff



Semicutoff



Noncutoff



Required for luminaires greater than 100 W.

Summary

## Allowed Lighting Power

*Table 1 – Summary of Lighting Power Allowances (W/ft<sup>2</sup> unless otherwise noted)*

| Lighting Application  | Lighting Zone 1 | Lighting Zone 2 | Lighting Zone 3 | Lighting Zone 4 |
|---|-----------------|-----------------|-----------------|-----------------|
| Parking Lots  | 0.04            | 0.06            | 0.08            | 0.20            |
| Building Grounds  | 0.30            | 0.35            | 0.40            | 0.45            |
| Building Entrances  | 0.50            | 0.50            | 1.00            | 1.50            |
| Building Facades[CE1] ↑                                       | Not allowed     | 0.18            | 0.35            | 0.50            |
| Sale Vehicle Lots   | Not allowed     | 0.25            | 0.50            | 1.00            |
| Sale Vehicle Lots and Other Outdoor Sales (Street Frontage) ↑ | Not allowed     | 17.5 (W/ft)     | 35 (W/ft)       | 70 (W/ft)       |
| Other Outdoor Sales   | Not allowed     | 0.25            | 0.50            | 1.00            |
| Internally Illuminated Panel Signs ↑                          | 20 W per face   | 4.00            | 6.00            | 8.00            |
| Externally Illuminated Signs ↑                                | 20 W per face   | 1.00            | 2.00            | 4.00            |
| Public Rights of Way - Expressway                             | 0.036           | 0.036           | 0.079           | 0.054           |
| Public Rights of Way - Major                                  | 0.036           | 0.069           | 0.084           | 0.103           |
| Public Rights of Way - Collector                              | 0.036           | 0.067           | 0.074           | 0.077           |
| Public Rights of Way - Local                                  | 0.036           | 0.036           | 0.049           | 0.083           |
| Public Rights of Way - Freeway Class A                        | n. a.           | 0.043           | 0.043           | 0.043           |
| Public Rights of Way - Freeway Class B                        | n. a.           | 0.056           | 0.056           | 0.056           |

↑ Indicates that the allowance is a “use-it-or-lose-it” allowance that can only be used for the intended lighting application.

Summary



## Basic Research Methodology

- Design criteria:
  - Highest IESNA recommendation used for LZ3.
  - Lowest IESNA recommendation used for LZ2.
  - 50% of LZ2 for LZ1.
  - Double LZ3 for LZ4.
- Lighting equipment.
- Lighting models.
- Calculations.
- Different method for billboards based on manufacturers recommendations.

**Summary**

